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Background	Work–life conflict has been poorly studied as a cause of ill-health in occupational medicine.
Aims	To study associations between physical and psychosocial working conditions, including work–life conflict on the one hand and general, physical and mental health outcomes on the other.
Methods	Cross-sectional data were used from an employee survey among the workforces of four medium-sized and large companies in Switzerland. Physical work factors included five demands and exposures such as heavy loads, repetitive work and poor posture. Psychosocial factors included 14 demands and limited resources such as time pressure, overtime, monotonous work, job insecurity, low job autonomy, low social support and work–life conflict. Health outcomes studied were self-rated health, sickness absence, musculoskeletal disorders, sleep disorders, stress and burnout.
Results	There was a response rate of 49%; 2014 employees participated. All adverse working conditions were positively associated with several poor health outcomes in both men and women. After mutual adjustment for all work factors and additional covariates, only a few, mainly psychosocial work factors remained significant as risk factors for health. Work–life conflict, a largely neglected work-related psychosocial factor in occupational medicine, turned out to be the only factor that was significantly and strongly associated with all studied health outcomes and was consistently found to be the strongest or second strongest of all the studied risk factors.
Conclusions	Even in an industrial work environment, psychosocial work factors, and particularly work–life conflict, play a key role and need to be taken into consideration in research and workplace health promotion.
Key words	Burnout; musculoskeletal disorders; physical and psychosocial work factors; self-rated health; sickness absence; sleep disorders; stress; work-life conflict.

Introduction

Numerous strenuous or stressful working conditions, adverse job characteristics and poor occupational exposures are known to be health risk factors. Physical factors and ergonomic exposures at work have been studied predominantly with regard to musculoskeletal disorders, mostly in blue-collar or industrial workers. Psychosocial work factors have mainly been studied with regard to cardiovascular diseases, stress-related disorders or mental health problems and/or general health outcomes, and among white-collar workers and public servants. Another important work- and stress-related psychosocial factor that has been explored with regard to health is work–life conflict, originally conceptualized as an inter-role conflict between work and family resulting in three forms and two directions of negative spillover effects from one role or life domain to the other [1]. But while this multidimensional and bidirectional concept is widely used and well established in occupational health psychology [2], it has been little addressed in occupational medicine so far [3]. Only a few studies have examined both physical and psychosocial factors simultaneously [4,5] and no single study has ever considered work factors of both types, including work–life conflict as a proven work stressor and health risk factor [3]. The aim of this study, therefore, was to close this research gap.

Table 1. Prevalence rates of different health outcomes among industrial workers by various working conditions and stratified by sex (n = 2014)

		Poor self-rated health		Long sickness absence (6+ days/ year)		Severe back/low back pain		Severe neck/ shoulder pain		Severe sleep disorders		Strong stress feelings		Increased burnout symptoms (16–24)	
		%		%		%		%		%		%		%	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F
Total study population		13	16	**15**	**22**	11	12	**10**	**22**	11	10	15	17	**6**	**10**
Physical working conditions[a]															
High work pace[b] (82%[c])	No	15	16	15	24	**8**	12	9	20	9	**4**	**11**	**4**	**2**	9
	Yes	13	15	15	21	**11**	12	10	22	11	**12**	**15**	**20**	**6**	10
Uniform arm or hand movements[b] (50%[c])	No	**11**	11	**12**	19	**9**	7	7	**14**	**9**	9	**13**	20	**4**	13
	Yes	**16**	18	**18**	23	**13**	**15**	**13**	**25**	**13**	11	**17**	16	7	9
Repetitive work[b] (49%[c])	No	**11**	7	**12**	19	**8**	14	7	20	**9**	7	13	21	**4**	10
	Yes	**16**	**21**	**18**	23	**14**	12	**13**	23	**13**	13	16	15	7	10
Painful or tiring posture[b] (45%[c])	No	**9**	**6**	**12**	19	**6**	**5**	**4**	**14**	7	8	**12**	14	**3**	**6**
	Yes	**19**	**24**	**18**	23	**18**	**19**	**17**	**28**	**16**	12	**18**	20	**9**	**13**
Carrying heavy loads[b] (35%[c])	No	**12**	14	**12**	22	**9**	12	9	21	**10**	**8**	14	16	**5**	10
	Yes	**17**	19	**19**	20	**14**	14	11	22	**13**	**16**	16	20	**8**	10
Psychosocial working conditions[a]															
High time pressure (72%[c])	No	**10**	**9**	**18**	**14**	10	8	7	17	**8**	**5**	**8**	**12**	**2**	**5**
	Yes	**15**	**19**	**14**	**24**	11	15	**11**	24	**12**	**13**	**17**	**21**	7	**17**
Frequent interruptions (58%[c])	No	13	18	**18**	21	9	10	8	18	**8**	10	**9**	**13**	**2**	**6**
	Yes	14	14	**13**	22	12	13	11	24	**13**	11	**19**	**21**	**8**	**13**
Steadily growing workload (57%[c])	No	14	16	14	21	**9**	10	7	**17**	7	**6**	**8**	**11**	**2**	**4**
	Yes	13	15	15	22	**12**	14	**12**	**26**	**14**	**16**	**19**	**25**	**8**	**16**
Poor promotion prospects (55%[c])	No	**8**	12	13	17	**8**	**7**	**5**	**16**	**8**	**7**	**9**	13	**3**	**4**
	Yes	**18**	18	16	24	**13**	**16**	**13**	**26**	**13**	**14**	**19**	20	**8**	**14**
No work time flexibility (41%[c])	No	13	**11**	**12**	20	10	12	10	21	**9**	9	14	17	5	11
	Yes	15	**22**	**19**	24	13	14	10	22	**13**	12	15	17	7	9
Regular overtime (32%[c])	No	13	15	**16**	22	**10**	11	9	19	10	10	**12**	**14**	**4**	**8**
	Yes	14	16	**12**	20	**13**	13	11	26	12	11	**21**	**26**	**9**	**15**
Monotonous work[b] (30%[c])	No	**11**	**10**	**11**	20	**9**	**10**	7	**19**	**8**	9	**12**	17	**4**	8
	Yes	**19**	**27**	**23**	24	**14**	**17**	**16**	**27**	**18**	13	**20**	18	**11**	14
Low job autonomy (22%[c])	No	**12**	14	**13**	21	**9**	12	**8**	21	**9**	10	**13**	19	**4**	10
	Yes	**17**	22	**19**	23	**15**	14	**16**	21	**19**	14	**20**	13	**10**	13
Low social support (21%[c])	No	**12**	13	14	21	10	**8**	**9**	**17**	**9**	**6**	**11**	**13**	**3**	**6**
	Yes	**20**	21	16	23	13	**27**	**13**	**35**	**17**	**25**	**30**	**31**	**16**	**21**
Status inconsistency (18%[c])	No	**12**	16	14	22	**9**	**10**	**8**	**19**	**9**	10	**13**	18	**4**	9
	Yes	**21**	14	17	12	**16**	**21**	**16**	**35**	**18**	14	**22**	16	**13**	12
Job insecurity (17%[c])	No	**11**	15	**13**	20	11	13	**9**	21	**9**	9	**13**	16	**4**	**9**
	Yes	**23**	14	**22**	30	11	6	**13**	22	**18**	18	**23**	24	**12**	**18**
High work–life conflict (0–48; >18) (16%[c])	No	**11**	15	**13**	21	**9**	11	7	20	**6**	**8**	**9**	**12**	**1**	**6**
	Yes	**27**	23	**23**	28	**21**	20	**20**	28	**31**	**30**	**39**	**59**	**25**	**43**
Work time changes at short notice (15%[c])	No	13	16	15	22	**10**	12	**9**	21	10	10	**13**	16	**5**	**9**
	Yes	15	18	15	18	**14**	20	**14**	23	13	15	**24**	26	**12**	**21**
Poor compatibility of work hours (15%[c])	No	**12**	16	**14**	21	10	13	**8**	21	**8**	**9**	**12**	**15**	**3**	**8**
	Yes	**21**	18	**20**	29	14	9	**15**	27	**26**	**27**	**30**	**55**	**18**	**46**

Chi-square tests: $P \leq 0.05$ (in bold).

[a]Prevalence rates of health outcomes in the non-exposed or reference group (upper percentage) and the exposed group (lower percentage).

[b]Applies partly, largely or fully to the job situation.

[c]Frequency of such working condition, job characteristic or occupational exposure in the entire study population.

Table 2. Associations of adverse physical and psychosocial working conditions with different health outcomes among industrial workers (n = 2014)

	Poor self-rated health		Long sickness absence (6+ days/year)		Severe back/ low back pain		Severe neck/ shoulder pain		Severe sleep disorders		Strong stress feelings		Increased burnout symptoms (16–24)	
	14%[a]		16%[a]		11%[a]		12%[a]		11%[a]		15%[a]		6%[a]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Physical working conditions														
High work pace[b] (82%[a])	0.68	0.45–1.04	0.87	0.59–1.29	1.25	0.73–2.12	0.69	0.43–1.10	0.96	0.57–1.63	1.06	0.67–1.70	1.18	0.50–2.83
Uniform arm or hand movements[b] (50%[a])	0.89	0.63–1.27	1.23	0.89–1.70	0.95	0.64–1.39	1.38	0.94–2.03	0.96	0.64–1.43	1.14	0.81–1.60	0.75	0.42–1.31
Repetitive work[b] (49%[a])	0.95	0.66–1.38	0.85	0.61–1.20	0.87	0.58–1.31	0.77	0.52–1.15	0.95	0.63–1.47	0.76	0.53–1.09	0.65	0.35–1.20
Painful or tiring posture[b] (45%[a])	**2.27**	**1.61–3.22**	1.20	0.88–1.65	**3.32**	**2.24–4.90**	**2.99**	**2.05–4.37**	**1.57**	**1.06–2.33**	1.15	0.82–1.61	**2.53**	**1.42–4.50**
Carrying heavy loads[b] (35%[a])	1.10	0.78–1.56	0.90	0.65–1.24	1.02	0.70–1.50	**0.66**	**0.45–0.97**	0.93	0.63–1.39	0.95	0.66–1.36	0.90	0.49–1.63
Psychosocial working conditions														
High time pressure (72%[a])	**1.83**	**1.22–2.76**	0.97	0.68–1.38	0.87	0.56–1.34	1.02	0.66–1.58	0.96	0.60–1.54	1.11	0.73–1.70	0.82	0.38–1.76
Frequent interruptions (58%[a])	0.77	0.55–1.08	0.90	0.66–1.23	0.99	0.68–1.45	1.07	0.74–1.54	1.12	0.76–1.68	**1.47**	**1.04–2.09**	**1.84**	**1.00–3.39**
Steadily growing workload (57%[a])	**0.53**	**0.38–0.73**	1.17	0.86–1.59	1.01	0.69–1.46	1.43	0.99–2.06	**1.51**	**1.01–2.27**	**1.58**	**1.12–2.23**	**2.14**	**1.15–3.97**
Poor promotion prospects (55%[a])	**1.65**	**1.17–2.32**	1.12	0.83–1.52	1.35	0.93–0.95	**1.74**	**1.20–2.54**	1.06	0.73–1.56	**1.40**	**1.00–1.94**	1.24	0.70–2.19
No work time flexibility (41%[a])	1.10	0.77–1.58	1.20	0.86–1.66	0.98	0.66–1.45	0.82	0.55–1.21	0.89	0.59–1.36	1.10	0.77–1.57	1.41	0.78–2.52
Regular overtime (32%[a])	1.11	0.76–1.61	0.83	0.58–1.20	1.38	0.92–2.06	1.27	0.86–1.89	1.03	0.66–1.56	1.29	0.90–1.84	1.17	0.64–2.13
Monotonous work[b] (30%[a])	1.32	0.92–1.88	**1.71**	**1.23–2.37**	0.97	0.65–1.45	**1.58**	**1.08–2.30**	**1.52**	**1.02–2.29**	1.39	0.97–2.00	**2.68**	**1.50–4.80**
Low job autonomy (0–52; <27) (22%[a])	0.68	0.46–1.01	0.90	0.63–1.29	1.18	0.77–1.80	1.33	0.88–2.02	1.37	0.91–2.08	0.90	0.60–1.34	0.91	0.50–1.66
Low social support (21%[a])	1.24	0.86–1.78	1.06	0.74–1.52	1.24	0.84–1.83	1.26	0.86–1.83	**1.66**	**1.13–2.45**	**2.07**	**1.49–2.89**	**3.24**	**1.97–5.34**
Status inconsistency (18%[a])	1.31	0.90–1.89	0.80	0.54–1.18	1.47	0.99–2.19	**1.51**	**1.03–2.21**	1.22	0.81–1.85	0.91	0.63–1.32	1.47	0.86–2.50
Job insecurity (17%[a])	**1.78**	**1.25–2.54**	**1.80**	**1.28–2.53**	0.66	0.42–1.04	0.88	0.58–1.34	**1.52**	**1.02–2.27**	1.30	0.91–1.86	1.70	0.99–2.91
High work–life conflict (0–48; >18) (16%[a])	**2.44**	**1.64–3.61**	**1.98**	**1.35–2.91**	**2.62**	**1.71–4.01**	**1.89**	**1.23–2.88**	**4.27**	**2.84–6.32**	**4.35**	**3.04–6.23**	**10.93**	**6.20–19.3**
Work time changes at short notice (15%[a])	1.17	0.75–1.83	1.13	0.73–1.75	1.15	0.72–1.83	1.21	0.77–1.92	1.21	0.74–2.00	1.27	0.85–1.89	1.61	0.86–3.01
Poor compatibility of work hours with private obligations (15%[a])	1.21	0.77–1.89	1.10	0.72–1.68	0.73	0.43–1.21	1.10	0.67–1.81	**1.68**	**1.07–2.64**	1.27	0.84–1.93	1.37	0.75–2.51

Table 2. (*Continued*)

	Poor self-rated health		Long sickness absence (6+ days/year)		Severe back/ low back pain		Severe neck/ shoulder pain		Severe sleep disorders		Strong stress feelings		Increased burnout symptoms (16–24)	
	14%[a]		16%[a]		11%[a]		12%[a]		11%[a]		15%[a]		6%[a]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Control variables														
Sex (female) (18%[a])	1.07	0.71–1.60	**1.56**	**1.10–2.21**	1.30	0.85–1.97	**2.64**	**1.82–3.82**	1.38	0.87–2.18	**1.48**	**1.01–2.18**	**3.89**	**2.15–7.06**
Age (16–69; one additional year)	**1.02**	**1.01–1.04**	0.99	0.98–1.00	1.01	0.99–1.02	0.99	0.98–1.01	1.01	1.00–1.03	0.99	0.98–1.00	0.99	0.96–1.01
Education (1–10; one higher level)	**0.90**	**0.83–0.98**	**0.87**	**0.81–0.95**	0.96	0.88–1.05	0.93	0.85–1.02	**0.89**	**0.81–0.98**	0.96	0.89–1.04	1.01	0.89–1.16

Multiple adjusted odds ratios (ORs) (all variables simultaneously included in the analysis): $P \leq 0.05$ (in bold); those not exposed or not working under such conditions were used as a reference group (OR = 1). CI, confidence interval.
[a]Frequency of such health problem, working condition or demographic characteristic in the entire study population.
[b]Applies partly, largely or fully to the job situation.

Methods

The study was based on cross-sectional data from an employee survey conducted in 2010 among the workforces of four medium-sized and large companies from different regions of Switzerland and diverse industries (building; machine; chemical/pharmaceutical; metal working). Physical demands and exposures at work were measured using five single items taken mainly from the Swiss Health Survey.

Psychosocial demands and resources at work were assessed using 12 single-item measures selected mostly from the Effort-Reward Imbalance Questionnaire of Siegrist *et al.* [6] or from the European Working Conditions Survey, and two multiple-item measures of job autonomy and work–life conflict taken and adapted from the Copenhagen Psychosocial Questionnaire of Kristensen *et al.* [7] and the work–family conflict scale of Carlson *et al.* [8].

Health outcomes were assessed by commonly used self-reported general health and days of absence from work for health reasons, by reports of severe backache or low back pain and severe neck or shoulder pain as measured in the Swiss Health Survey, by a well-validated single item on general psychological stress symptoms used in the Occupational Stress Questionnaire [9], and by a scale of six items selected from the Copenhagen Burnout Inventory [10].

Results

The overall return rate of the postal survey was 49%, with a total of 2014 submitted and completed questionnaires. The return rates among the four companies varied between 44 and 66%.

Bivariate analyses almost consistently showed higher prevalence rates among those exposed compared with the non-exposed (Table 1), particularly in men, whereas in women prevalence rates were mostly higher but differences were sometimes not statistically significant due to the small number of cases.

Multivariate analyses then showed independent health effects of the adverse working conditions included (Table 2). Only the strongest associations observed in Table 1 remained significant after adjustment for all covariates. Among the physical working conditions, painful or tiring posture at work was found to be a major and independent risk factor for health, particularly for self-rated general health and musculoskeletal health. Among the psychosocial work factors, frequent interruptions, a growing workload, monotony and low social support turned out to be important risk factors for mental health, whereas time pressure, poor promotion prospects and job insecurity were found to be risk factors for self-rated general health. Work–life conflict was the only work-related risk factor that was significantly and strongly associated with all the health outcomes studied and was found to be the strongest of all risk factors, except for musculoskeletal health.

Discussion

The most significant finding of our study was that work–life conflict was the clearest and strongest health risk factor of all the associations between physical and psychosocial work factors and various health outcomes. Previous

studies in occupational medicine either did not consider both types of work factors and/or ignored work–life conflict as an additional psychosocial factor and a proven work-related stressor. This study included them all and found psychosocial work factors to be stronger risk factors for health than physical work factors and occupational exposures across different health outcomes. This finding is fully in line with Niedhammer *et al.* [4], one of the few other studies to have examined psychosocial work factors and other occupational risk factors simultaneously.

In this study, numerous physical and psychosocial working conditions and various general, physical and mental health outcomes were considered and particularly work–life conflict as a largely ignored psychosocial work and health risk factor in occupational medicine was included. Moreover, the present study provides initial evidence from a sample of mostly blue-collar workers from the industrial sector who would be expected to be more exposed to adverse physical loads and less exposed to psychosocial demands at work.

The study has some limitations. Firstly, long-term effects of adverse working conditions on health outcomes and causal relations between these factors could not be studied and reverse causality cannot be excluded either, as the data used were cross-sectional. Secondly, the findings cannot be fully generalized and transferred to other populations since the study sample was not representative of the entire blue-collar workforce or the industrial sector as a whole. Thirdly, common method variance cannot be completely excluded due to the use of self-reported data on working conditions and health outcomes.

It can be concluded from the study results that psychosocial work factors in general and negative spillover effects and role conflicts between professional and personal life in particular play an important role even among blue-collar workers and in an industrial work environment, and need to be taken into consideration in the practice of prevention and workplace health promotion.

Key points

- Even among industrial and construction workers, psychosocial work factors were found to be stronger risk factors for general, and particularly for mental health, than physical work factors.
- Work–life conflict turned out to be the only (psychosocial) work factor that was significantly, consistently and strongly associated with all the health outcomes studied.
- Psychosocial work factors, and particularly work–life conflict, need to be considered as a higher priority in occupational health research and in the organizational practice of prevention and health promotion.

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Conflicts of interest

None declared.

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